ELECTRONIC RESOLUTION METER.

[redacted]

A device is required which will ascertain the resolution of a photographic image, so that the quality of photographs may be measured, and the capabilities of the system which produced the photograph ascertained immediately. It is required that the device function from operational photographs, rather than standard test patterns. Thus, the basic problem is to automatically measure resolution in a manner that is relatively independent of the size and contrast of the objects photographed.

If the photograph is scanned with a flying spot scanner, the signal obtained from a photoelectric cell viewing the spot can provide a means for measuring resolution. This is so because the frequency content of the signal bears a direct relationship to the resolution. The presence of high frequencies in the signal indicates high resolution.

A device may be constructed which consists of a simple flying spot scanner which produces a small spot of light which is focused on the plane of the image and moved rapidly across a portion of the photograph. It will be possible to accomodate either positives, negatives, opaque prints, or transparancies, all with the same machine. A fixed scanning pattern may be employed and the photograph may be positioned so that the resolution of selected portions may be ascertained. A direct reading meter output, calibrated in lines per millimeter, may be provided.

In the electronic circuits connected to the photocell output, the frequency analysis must be made in a manner which will give a measurement that is independent of the objects in the photograph.

This may be accomplished first, by adjusting the video signal to a fixed peak-to-peak value by means of an automatic gain control. The entire signal is applied to a differentiating circuit which provides an output proportional to the time rate of change of picture intensity. A peak reading voltmeter applied to the differentiating circuit output then provides a measure of resolution. By confining the scan to a small area of the photograph, resolution readings may be obtained both in the regions of low and high contrast.

A more elaborate, and perhaps more accurate measurement, particularly when the area scanned contains both very light and very dark objects, may be obtained as follows. The output of the differentiating circuit, together with a running average of the video signal amplitude $\bar{A}$, are applied to a quotient circuit which computes

$$\frac{\frac{dA}{dt}}{\bar{A}} \propto \frac{\frac{dA}{\bar{A}}}{dx}$$

The output of this circuit is a measure of the percentage rate of change of picture gray level per unit distance along the photograph, and is therefore independent of the particular value of A. A peak reading voltmeter again is used, so that the highest value, rather than the average value, of this quantity is recorded on the meter. The value of A is obtained by integrating (with an RC filter) the instantaneous value of the peak to peak excursion of the video signal. Thus A is a measure of the short time average of the picture intensity variation level.